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ABSTRACT

The purpose of this study was to examine the nature of the expectancy-performance relationship for each sex and to determine whether cross-sex comparisons are appropriate. Students' expectancies for academic performance and the relationship of the expectancies to actual grades were examined. Subjects were 331 students (168 women and 163 men) enrolled in a variety of courses at a small Midwestern university, and courses were chosen to represent a wide range of sex-role stereotypes as well as sex-role neutral disciplines. On the first day of examination, the experimenter distributed questionnaires asking students to indicate the grade they expected. Actual grades were obtained from professors following the examination. The conclusion was made that, relative to men, women's lower academic achievement cannot be attributed to their lower expectancies for success, and that women's expectancies do not seem to have the same effect upon, or relationship to, their academic performance. The conclusion also was made that in order to avoid incorrect cross-sex comparisons, an analysis must be made of the equivalence of the within-sex regression equations. Suggestions were also made for studies comparing other types of groups. (LMO)

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CROSS-SEX COMPARISONS:

A WORD OF CAUTION

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Abstract

While it was demonstrated that intrasex correlations between expectancies and academic performance were similar, regression analyses indicated that comparison of variables across sexes was inappropriate. Potential hazards of overlooking such analyses in making cross-group comparisons are noted, and a method for examining the appropriateness of these comparisons is demonstrated.

CROSS-SEX COMPARISONS: A WORD OF CAUTION

Within the research comparing women and men, a gender difference on one variable is often hypothesized to be caused by, related to, or result in, a gender difference on a second variable. Comparative research on expectancies and achievement fit into this model. Gender differences in expectancies are hypothesized to result in, or be related to, gender differences in achievement. Initially, the study to be reported in this paper was designed to examine the validity of this hypothesis. However, while reviewing the related literature, questions arose about the legitimacy of comparing certain findings across the sexes. Specifically, questions were raised about inferring between-sex differences on an outcome variable based upon cross-sex comparisons of a predictor variable.

Within the context of the study to be reported, women's and men's expectancies would be considered to be a predictor variable. They are labeled as such because they are assumed to bear a specific (in this case, linear) relationship to performance, the outcome variable. Due to this relationship it is further assumed that knowledge about cross-group differences in the level of expectancies provides information about cross-group differences in the level of performance. Given within-group comparisons, this assumption is valid. However, given between-group comparisons, this assumption may be incorrect. Differences in the predictor variable cannot be assumed to imply cross-group differences in the corresponding

outcome variable. This is because the nature of the relationship between the predictor and outcome variables may be different for the two groups. Thus, gender differences in expectancies should not be assumed to imply any corresponding differences in performance.

In making between-group comparisons on an outcome variable, a major concern focuses on assessing for each group the nature of the relationship between the outcome and predictor variables. Such assessment, however, is rarely, if ever, considered. The danger in ignoring or overlooking this information is a false impression of the presence or absence of certain between-group differences. How this danger manifests itself is illustrated in the history of the research on male-female differences in expectancies.

Previous research has demonstrated a strong relationship between the expectancy of success and achievement (e.g., Battle, 1965, 1966; Crandall, 1969; Crandall, Katkovsky, & Preston, 1962; Simon & Feather, 1973). Several studies have also demonstrated that such a relationship need not be a function of the subjects' own rational appraisal of their competence or ability. For example, Feather (1963a, 1963b, 1966) and Tyler (1958) found that achievement behaviors and achievement outcomes correlate positively with the subjects' expectancies of success even when such expectancies were experimentally manipulated. Interestingly, they found that higher expectancies led to significantly better performance even when the subjects' expectancies bore no relationship to their actual ability at the

at the experimental task.

Aside from the strong relationship between expectancy of success and achievement, it has also been documented that females hold lower expectancies than males (e.g., Battle, 1966; Crandall, 1969; Deaux & Emswiller, 1974; Feather, 1969; Montanelli & Hill, 1969; Parsons & Ruble, 1977). Given that sex differences in expectancies exist, and given that such expectancies are related to achievement outcomes, several researchers have assumed that lower expectancies provide a possible explanation for women's lower relative lack of achievement (e.g., Crandall, 1969; Frieze, 1975; Parsons, Ruble, Hodges, & Small, 1976). However, this assumption may not be accurate. Several studies have reported that the lower expectancies held by females led to either equivalent or superior performances in comparison to males (Crandall, 1969, Study B; Hoffman, 1972; Maccoby & Jacklin, 1974; Montanelli & Hill, 1969). Thus, it appears that differential expectancies across the sexes can lead to similar achievement outcomes. In other words, the relationship between expectancies and academic performance may not be the same for women as it is for men.

In order to examine the nature of the expectancy-performance relationship for each sex and to determine whether cross-sex comparisons are appropriate, the present study was undertaken. The study examined students' expectancies for academic performance and the relationship of these expectancies to actual grades. Based upon prior findings, four hypotheses were developed.

1. Expectancies and performance will be positively correlated for both men and women.

2. Men will hold higher expectancies for academic performance than women.

3. Women and men will not differ in terms of actual academic performance.

4. The regression equations describing the relationship between expectancies and performance for each sex will differ. This would imply that making cross-group comparisons of performance based upon expectancies would be inappropriate.

Method

Subjects

Subjects were 331 students (168 women and 163 men) enrolled in a variety of courses at a small Midwestern university. Courses were selected to represent a wide range of sex-role stereotyped as well as sex-role neutral disciplines (e.g., English literature, psychology, physics, and chemistry). Students were given the option of not participating in the study if they so desired; however, all students chose to participate.

Apparatus and Procedure

Permission was given by professors for the experimenters[1] to come to class and collect data on the day prior to the first in-class examination. Questionnaires were distributed, and subjects were asked to indicate what grade they expected to receive on the forthcoming test. They did this by circling the expected grade on a 12-point scale labeled from A to F,

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[1]Many, many thanks to Julie Pratt, Chris Toskin, Laurie Rooker, and Beth Mehne for collecting the data for this study.

including intermediate grades. Following the examination, the actual grades for all subjects were obtained from the professors.

Results

The results of the study replicated previous findings and supported all four of the research hypotheses. Within each sex, expectancies were positively correlated with performance (women: $r = .29$, $p < .001$; men: $r = .40$, $p < .001$). Furthermore, men's expectancies were significantly higher than women's ($t(329) = 2.54$, $p = .01$), while women received slightly, though nonsignificantly, higher grades than men ($t(329) = -1.03$, $p = .30$). Taken together, these findings contradict the implicit assumption in the literature that women's lower expectancies result in poorer test performance.

To examine the relationship between expectancies (X) and performance (Y), a regression equation was generated for each sex. For men, the equation was $Y = -0.88 + 0.79X$; for women, $Y = 1.54 + 0.61X$. The equivalence of these two equations was investigated using a method outlined by Snedecor and Cochran (1967, chap. 14). This method involves comparing three different components of the two regression equations: their residual variances, their slopes, and their Y-intercepts. As illustrated in Table 1, a comparison of the residual variances indicated no significant difference between the two equations ($F(161, 166) = 1.01$, p = n.s.). Similarly, the two slopes were not significantly different from each other ($F(1, 327) = 0.66$, p = n.s.). However, a comparison of the Y-intercepts revealed a

Table 1

Comparison of Regression Lines

	d.f.	x^2	xy	y^2	Reg. Coef.	Deviations from Regression d.f.	S.S.	M.S.
Within								
Women	167	358	219	1639	.613	166	1505	9.066
Men	162	432	343	1740	.794	161	1468	9.118
						327	2973	9.092
Pooled, W	329	790	562	3379	.711	328	2979	9.082
		Difference between slopes				1	6	6
Between, B	1	16	-12	11				
W + B	330	806	550	3390		329	3015	
		Between adjusted means				1	36	36

Comparison of residual variances:

$F = 9.118/9.066 = 1.006$ (d.f. = 161,166) N.S.

Comparison of slopes:

$F = 6/9.092 = 0.660$ (d.f. = 1,327) N.S.

Comparison of Y-intercepts:

$F = 36/9.082 = 3.964$ (d.f. = 1,328) $p < .05$

significant difference, indicating that the two equations are not equivalent ($F(1, 328) = 3.96$, $p < .05$). Thus, the relationship between expectancies and academic performance is not the same for women as it is for men.

Discussion

Two conclusions can be drawn from the results of this study. First, relative to men, women's lower academic achievement cannot be attributed to their lower expectancies for success. Women's expectancies do not seem to have the same effect upon, or relationship to, their academic performance. Specifically, a given level of expectancy stated by a female subject appears to be associated with the same level of performance as a male stating a somewhat higher expectancy. In fact, the women in this study, and in others previously published (Crandall, 1969, Study B; Hoffman, 1972; Maccoby & Jacklin, 1974; Montanelli & Hill, 1969), held lower expectancies, but did not perform at a lower level. It is, of course, possible that lower expectancies may make women less likely to engage in an achievement task. However, once they have undertaken the task, women do not appear to be handicapped by their expectancies.

The second conclusion from this study derives from the first: In order to avoid incorrect cross-sex comparisons, an analysis must be made of the equivalence of the within-sex regression equations. Such an analysis can be performed by comparing the residual variances, slopes, and Y-intercepts of the two equations (again, see Snedecor & Cochran, 1967, chap. 14

for specific procedures concerning these comparisons). Without this analysis it should not be assumed that the same predictive relationship between two variables (e.g., expectancy and academic performance) holds for both sexes. Empirical examination of this assumption is necessary.

While the current study has been limited to the comparison of gender differences, the need for an analysis of the regression equations may extend to the comparison of other types of groups. More specifically, it may apply whenever cross-group comparisons on a given variable are based upon cross-group comparisons of another variable. Furthermore, such an analysis should be applied, both for presumably causal relationships such as that between expectancy and performance as well as for correlational, noncausal relationships. An example of the latter would be the use of SAT scores to predict college performance. The relationship between these two measure is presumably mediated by outside factors such as intelligence and test-taking ability; one's SAT scores do not cause one's college grades. SAT scores are, however, used in a predictive manner in making admissions decisions. Thus, it should be empirically examined whether SAT scores bear the same relationship to college grades for different groups (e.g., women and men, minorities and whites, etc.). The risk of not empirically examining the implicit assumption of predictive equivalence is the possible acceptance of inaccurate information/assumptions regarding the comparative nature of different groups.

In terms of making an analysis of the equivalence of two

regression equations, a deviation from the procedures used in the current study may be more appropriate. This study used an alpha or rejection level of .05. This is standard procedure in most research, protecting against the danger of claiming that differences exist when, in fact, they do not (a type I error). However, in the case of cross-group comparisons, the standard strategies and rules of hypothesis testing are reversed. The danger comes not from claiming that two regression equations are different, but that they are equivalent. The claim of equivalence permits comparisons across the groups and may lead to incorrect conclusions and assumptions. Therefore, to protect against an inappropriate claim of equivalence (a type II error), it is proposed that the alpha or rejection leve be changed from its traditional value of .05 to .10. This makes it less likely that two regression equations will be judged to be equivalent when, in fact, they are not.

Finally, in terms of recommending an analysis of regression equations, an important limitation has been ignored: A study may not have data on either the predictor or outcome variable. Speculations about cross-group comparisons on an outcome variable based upon cross-group comparisons of a predictor variable are often made because data on the outcome variable are absent. Conversely, comparative inferences about a predictor variable are often made from data collected on an outcome variable. For example, gender differences in response to task failure (the outcome variable) may be hypothesized to be due to gender differences in failure-related attributions (the pre-

dictor variable). Or, in line with the current study, gender differences in academic achievement may be inferred to be the result of gender differences in expectancies.

Hypotheses about cross-group differences on either a predictor or outcome variable are relatively common. Yet, due to the lack of data on either the outcome or predictor variable a regression analysis cannot be performed. In these cases, researchers might consider a caveat concerning their comparative hypotheses. The researchers are assuming that the relationship between the predictor and outcome variables is the same for both groups. And, should this assumption be incorrect, hypotheses about cross-group differences or similarities may be inaccurate. Thus, while studies which can collect data on both the outcome and predictor variables should perform a regression analysis, studies which do not have the requisite data should be aware of the dangers involved in making any comparative hypotheses.

The question now exists as to how many cross-group comparisons have been made in the literature, and how many of these comparisons have left us with an incorrect assumption about the comparative nature of different groups.

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